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	Effective Date: 1-March-2005
<p data-bbox="250 348 636 380">15 HAIR/FIBER ANALYSIS</p> <p data-bbox="293 426 1451 894">Typically DNA analysis is conducted on all appropriate non-hair evidence prior to any hair examinations being conducted, even when hair examinations are requested. BEFORE PROCEEDING to screen hairs for nuclear DNA suitability, carefully consider the probative nature of information that may be gleaned from this examination. It may be appropriate to discuss this further with the Trace Evidence (TE) examiner and/or the investigator before proceeding. The determination of whether to proceed is not dependent on a request for this examination, but will be based solely on whether the information gained may reasonably be expected to provide probative information for the case when no other evidence has yielded a probative DNA profile. A phone call to the investigator is not required. If a probative DNA profile from a hair is “matched” to a suspect’s or victim’s known profile or a DNA Data Bank search from such a profile results in a “match”, typically no hair examinations (species, race, body origin, unique characteristics) will be conducted, even when requested.</p> <p data-bbox="293 936 1451 1077">In addition to the information presented below, refer to the Decision Chart for Hair Examination found at the end of this chapter for further clarification and/or guidance. The Nuclear DNA Hair Referral form used by the TE examiner can be found in Appendix B. This form can be used by the SX examiner to supplement the notes.</p> <p data-bbox="293 1119 1451 1260">NOTE: A rare case may only contain hairs submitted for DNA testing (“Hair Only Case”). These cases will go to the Trace Evidence Section first, where the evidence will be examined for nuclear DNA suitable hairs and the appropriate hairs forwarded to the Forensic Biology Section (SX) examiner for DNA testing.</p> <p data-bbox="293 1302 873 1333">15.1 Hair/Fiber Recovery and Preservation</p> <p data-bbox="391 1375 1451 1476">15.1.1 When evidence is examined for biological substances, hairs/fibers may be collected from the item and/or left on the item for possible future recovery and examination.</p> <p data-bbox="391 1518 1451 1808">15.1.2 With the aid of oblique lighting, recover hairs/fibers and/or other trace evidence from items being examined for biological fluids using one or more of the following methods: forceps, post-it notes, low tack adhesive tape, gentle scraping and/or careful shaking over clean paper. High tack tape can be used to ensure complete recovery of hairs (not fibers), but ONLY for knit articles, such as hats, caps, masks, and scarves. If fibers are probative to the case, a high tack tape must not be used. It is important to note the following regarding the use of tape.</p> <p data-bbox="488 1850 1451 1919">15.1.2.1 The only high tack tapes approved for use are DFS evidence tape and clear packing tape.</p>	

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<p data-bbox="487 352 1422 495">15.1.2.2 High tack tape is approved for use as stated above only within DFS. Information regarding its use is not for dissemination to our contributors as an acceptable practice for the collection of hairs/fibers.</p> <p data-bbox="487 537 1409 680">15.1.2.3 If high or low tack tape is used for recovery, do not fold it on itself. It should be placed on clear plastic for return with the evidence. (When a post-it note is used for recovery of hairs/fibers, it can be folded on itself.)</p> <p data-bbox="391 722 1430 789">15.1.3 Package and appropriately label recovered hairs/fibers. Place the package in the item packaging.</p> <p data-bbox="391 831 1453 974">15.1.4 If hairs/fibers are to remain on the item for possible future recovery, protect the trace evidence from loss or other deleterious effects by examining the item for biological substances on clean paper, wrap the item in the same paper, and place it in the original packaging (when possible).</p> <p data-bbox="391 1016 1421 1192">15.1.5 If there is a possibility that loose hairs/fibers may be lost during the examination for biological substances (for example, while examining a broken windshield for blood, one or two hairs/fibers are noted on the glass), recover, package, and appropriately label these hairs/fibers. Place the package in the item packaging.</p> <p data-bbox="391 1234 1446 1562">15.1.6 Document findings and handling (i.e., hairs/fibers recovered, hairs/fibers observed/not recovered, hairs/fibers recovered and remain, etc.), including the method(s) used for recovery, in the case file. If tape or post-it notes are used to recover the hairs, document the type of tape used and/or how many tapings/post-it notes are returned with the evidence. It is also recommended that an estimate of the numbers of hairs observed and/or recovered (small number or large number) be documented. This will preclude the need to assess the number of hairs present at a later time if nuclear DNA suitability determinations on the hairs must be made.</p> <p data-bbox="297 1604 1323 1633">15.2 General Information About Screening Hairs for Nuclear DNA Suitability</p> <p data-bbox="391 1675 1453 1923">The decision regarding whether hairs are screened for nuclear DNA suitability by the SX or TE examiner is not based on the collective determination of a lot of hairs available when considering all items, but is determined per item. Thus, in any case, only the SX examiner may be determining suitability, only the TE examiner may be doing this, or both may be doing it. The SX examiner then proceeds to conduct DNA analysis on <u>all</u> appropriate hairs (if a small number of hairs are suitable) or starts with the “best” hairs first, as specified on the Hair Referral Form</p>	

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<p>completed by the TE examiner, and if no DNA profile is developed from those, moves on to the “next best”, etc.</p> <p>15.2.1 If no probative information is obtained from the DNA analysis of non-hair evidence or there is no such evidence on which to attempt DNA analysis in a case, and there are a small number of hairs on an item of evidence, the SX examiner will recover the hairs from the item and subsequently screen them for suitability for nuclear DNA analysis.</p> <p>15.2.2 If a determination of forcible removal of the hairs is needed, this determination must be made by the TE examiner prior to nuclear DNA analysis. In this situation, the TE examiner will concurrently do the hair examination (species, race, body origin, unique characteristics), including suitability for nuclear DNA analysis, and forward the hairs back to the SX examiner for DNA analysis.</p> <p>NOTE: A need for the determination of forcible removal of hairs is not a “blanket need” in all or even most homicides, sexual assaults and malicious woundings/felonious assaults. There are very few cases where this determination is of any true value. If you have a case where you believe this exam may be of value, but it has not been requested OR the investigator has requested the exam, the SX examiner must discuss the situation with the TE examiner BEFORE the hairs are forwarded to the TE examiner for this exam. This provides the TE examiner an opportunity to obtain further clarification from the investigator BEFORE the transfer of evidence takes place.</p> <p>15.2.3 If a large number of hairs are present on an item of evidence, the item may be forwarded to the Trace Evidence Section for collection of the hairs and a determination of the suitability of the hairs for nuclear DNA analysis. Typically, this necessitates at least a cursory examination of the item by the Forensic Biology examiner to determine that a large number of hairs are present. The Trace Evidence examinations may also include the species, race, body origin, and any unique characteristics.</p> <p>15.2.3.1 All hairs determined by the TE examiner to be suitable for nuclear DNA analysis will be forwarded back to the SX examiner to conduct the analysis.</p> <p>15.2.3.2 Nuclear DNA suitable hairs will be ranked as to suitability (ranking of 1 is most suitable) on the Hair Referral Form completed by the TE examiner, which accompanies the return of the hairs to the SX examiner.</p>	

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<p>15.2.4 Hairs previously mounted on microscope slides, typically re-submitted in old cold cases, will be forwarded to the TE examiner for de-mounting and assessment.</p> <p>15.3 Procedure for Screening Hairs for Suitability for Nuclear DNA Analysis</p> <p>15.3.1 To determine suitability for nuclear DNA testing, hairs may be examined with the aid of a stereo microscope and/or by placing a cover slip over the hairs mounted in water or xylene substitute on a glass microscope slide, followed by examination with a compound microscope using bright field illumination. When using the stereo microscope, paper/post-it notes or other such material providing varying contrasts with the hairs being examined may be helpful. If there is any question about the suitability, proceed with DNA typing.</p> <p>15.3.2 When hairs suitable for nuclear DNA analysis are found, the documentation should allow for tracking from the microscopic examination through the DNA interpretive stages. When no hairs suitable for nuclear DNA analysis are found, the documentation should reflect why the hair(s) are not suitable.</p> <p>15.3.3 The documentation should reflect the following information.</p> <p>15.3.3.1 Microscope(s) used, i.e., stereo and/or compound microscope.</p> <p>15.3.3.2 No hairs were found on an item(s).</p> <p>15.3.3.3 The approximate number of “hairs” and/or “hair fragments” recovered from an item on which nuclear DNA analysis will not be conducted and why. The term “hairs” should not be used as a collective term to refer to hairs <u>and</u> hair fragments. Following are some <u>examples</u> of documentation.</p> <p>15.3.3.3.1 “(approximate number of) hairs are banded – medulla >50% of hair diameter.” [This would not be consistent with human hairs, but typical of animal hairs.]</p> <p>15.3.3.3.2 “(approximate number of) hair fragments.”</p> <p>15.3.3.3.3 “No tissue observed on root of (approximate number of) hairs.”</p>	

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<div data-bbox="630 317 1446 386">15.3.3.3.4 “(approximate number of) suspected wool fibers – no roots, cuticle visible, and ____ in color.”</div> <div data-bbox="630 426 1446 863">15.3.3.3.5 “No dark hairs observed - victim known hairs are white/blonde.” [In the rare instance when the victim is reported as Caucasian and known hair samples from the victim are submitted and are white/blonde, yellow/blonde, strawberry blonde (e.g., not any shade of brown) and the suspect is reported as Black and no dark hairs (no hairs different from the victim’s known hairs) are observed on an item/items of evidence, it is not necessary for nuclear DNA analysis to be conducted on the blonde hairs which are otherwise suitable for testing.]</div> <div data-bbox="488 903 1446 1010">15.3.3.4 The exact number of hairs from each item on which nuclear DNA analysis will be conducted and why these were chosen for nuclear DNA analysis</div> <div data-bbox="630 1050 1446 1339">15.3.3.4.1 Use “???” when unsure of hair growth stage. [Forensic Biology examiners are only expected to be able to recognize that there is material (i.e., tissue) on a hair root (“strand”) that may be suitable for nuclear DNA testing and are not expected to be able to differentiate animal from human hairs, hairs from fibers, or know the exact growth stage of the hair with certainty.]</div> <div data-bbox="630 1379 1365 1449">15.3.3.4.2 Estimate of the amount (small amount, large amount, etc.) of tissue present.</div> <div data-bbox="488 1488 1338 1558">15.3.3.5 Additional specific observations about the hairs may be documented. Examples follow.</div> <div data-bbox="630 1598 1235 1631">15.3.3.5.1 “Very dark hair with a light root.”</div> <div data-bbox="630 1671 1235 1705">15.3.3.5.2 “Very light hair with a dark root.”</div> <div data-bbox="297 1745 1414 1814">15.4 As appropriate, conduct nuclear DNA analysis on the hair root tissue and record results.</div> <div data-bbox="391 1854 1409 1923">15.4.1 When no known blood/buccal swab sample from a victim and/or listed suspect is submitted for comparison, but a known hair standard from the</div>	

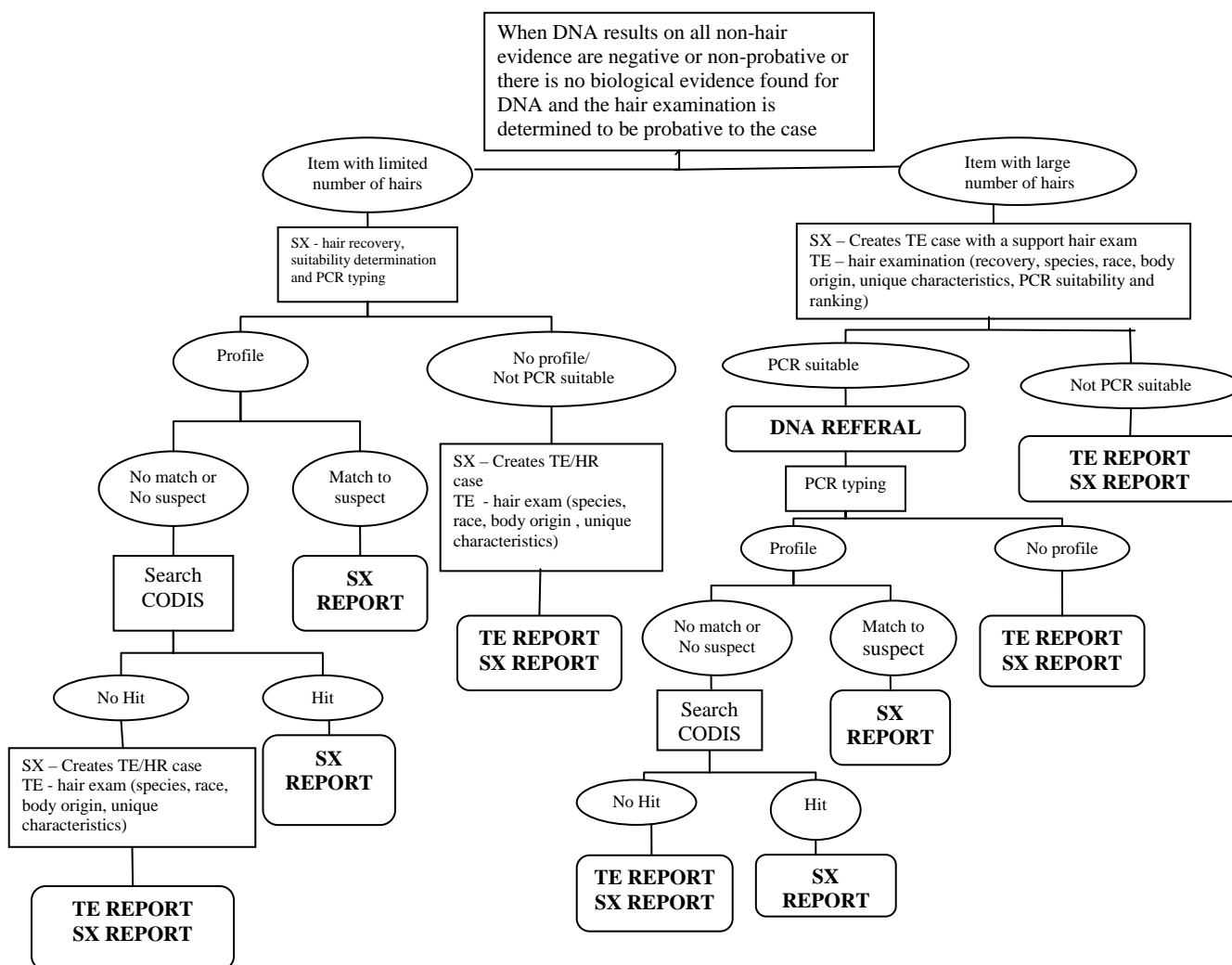
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<p>victim and/or suspect has been submitted, examine the hair standard for nuclear DNA suitable hairs to be used as a known sample.</p> <p>15.4.2 If a potentially probative DNA profile is developed from a hair(s) and the suspect is eliminated or there is no suspect and subsequently no match is obtained when the profile is searched in CODIS, or no DNA profile is obtained, the SX examiner may forward the hair(s) screened for PCR suitability to the TE examiner for a determination of species, race, body origin, and any unique characteristics. This would only be appropriate when that information would have probative value to the case. If the TE examiner recovered the hairs, these determinations were previously done.</p> <p>15.4.3 Typically, if DNA analysis on a hair(s) results in a probative profile which matches the victim's or suspect's known/"alternate" known sample, no hair examinations will subsequently be conducted, even if such an examination is requested. One notable exception to this may be the investigator's or Commonwealth Attorney's need to know the body origin of a hair from which a potentially probative DNA profile was developed (for example, the body origin of a hair found on a pair of child's underpants from which a potentially probative DNA profile was developed). In such a situation, the appropriate hair(s) will be forwarded to the TE examiner.</p> <p>15.5 Reporting Results</p> <p>15.5.1 For all cases, the results and conclusions of nuclear DNA analysis of hairs will be reported. When applicable, the profile(s) obtained from the hairs will be compared to the appropriate known or "alternate" known sample profile(s). If a suspect is eliminated, there is no suspect, or no known or "alternate" known sample is available, but a profile suitable for a DNA Data Bank search is developed, the search for a "match" to the profile will be conducted, and the results of the search reported.</p> <p>15.5.2 If no hairs suitable for nuclear DNA testing are found by the SX examiner, "No hairs suitable for nuclear DNA analysis were recovered from/observed on/contained in (<u>item description and item number</u>)" will be reported.</p> <p>15.5.3 For the rare situation where the victim is Caucasian and his/her known hairs are white/blonde and the perpetrator is reported as being Black and no dark hairs are found, only light hairs like the victim's are found, "After examining the victim's known hair samples (<u>item number</u>), no nuclear DNA analysis was conducted on any of the hairs recovered from (<u>item description and item number</u>)" will be reported.</p>	

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<p data-bbox="391 321 1453 426">15.5.4 If no probative biological evidence is found and the SX examiner observes that no hairs are present on an item of evidence, the absence of hairs will be reported by the SX examiner as “no hairs were observed.”</p> <p data-bbox="391 468 1414 611">15.5.5 If probative information is obtained from the DNA analysis of non-hair evidence in a particular case, typically no hair/fiber examinations will be conducted, even when requested. The SX report will reflect that the requested examinations were not conducted.</p> <p data-bbox="391 653 1442 936">15.5.6 In no suspect cases where the SX examiner determines suitability and goes forward with the DNA analysis and gets no profile or gets a profile, but no match in the Data Bank, and the hairs have been forwarded to the TE examiner for a determination of species, race, body origin, and any unique characteristics in accordance with the flow chart, the SX report will not be issued until the TE examiner has completed the examinations and the two examiners, coordinating together, determine that the reports accurately reflect the totality of the examinations conducted on the hairs.</p> <p data-bbox="297 978 1177 1010">15.6 If appropriate, forward item(s) to another section for analysis.</p> <p data-bbox="297 1052 1356 1083">15.7 Return evidence to the primary examiner or to security for final disposition.</p>	

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DECISION CHART FOR HAIR EXAMINATION

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